LABORATORY DATA CONSULTANTS, INC.
2701 Loker Ave. West, Suite 220, Carlsbad, CA 92010 Bus: 760-827-1100 Fax: 760-827-1099

IWM Consulting Group
7428 Rockville Road
Indianapolis, IN 46214
ATTN: Brad Gentry

September 25, 2018

SUBJECT: Former Amphenol Facility, Data Validation

Dear Mr. Gentry,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on September 19, 2018. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project #43160:

SDG #	**Fraction:**
50205666	Volatiles

The data validation was performed under Level III & IV guidelines. The analyses were validated using the following documents, as applicable to each method:

- Offsite Groundwater Monitoring Well Redevelopment & Sampling Work Plan, Franklin Power Products, Inc.,/Amphenol Corporation, Franklin, Indiana; September 2018
- USEPA National Functional Guidelines for Organic Superfund Methods Data Review; January 2017
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014

Please feel free to contact us if you have any questions.

Sincerely,

Pei Geng
Project Manager/Senior Chemist

104 pages-EM 1 WEEK TAT R1 (added B-C) Attachment 1

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LDC #43160 (IWM Consulting Group - Indianapolis, IN / Former Amphenol Facility)

LDC	SDG#	DATE REC'D	(3) DATE DUE	(9) VOA (TO-15/SIM)		(9) VOA (8260B)																													
Matrix:	Air/Water/Soil			A	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	10447725	09/19/18	09/26/18	14	0	-	-																												
A	10447725	09/19/18	09/26/18	2	0	-	-																												
B	10447804	09/19/18	09/26/18	13	0	-	-																												
B	10447804	09/19/18	09/26/18	1	0	-	-																												
C	50205666	09/19/18	09/26/18	-	-	7	0																												
C	50205666	09/19/18	09/26/18	-	-	1	0																												
Total	T/PG			30	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38

Shaded cells indicate Level IV validation (all other cells are Level III validation). These counts do not include MS, MSD, Dups.

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LDC Report# 43160C1

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Former Amphenol Facility

LDC Report Date: September 24, 2018

Parameters: Volatiles

Validation Level: Level III & IV

Laboratory: Pace Analytical Services, LLC.

Sample Delivery Group (SDG): 50205666

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
MW-31	5020566601	Water	09/14/18
MW-32	5020566602	Water	09/14/18
MW-33	5020566603	Water	09/14/18
MW-34**	5020566604**	Water	09/14/18
MW-35	5020566605	Water	09/14/18
Equipment Blank	5020566606	Water	09/14/18
Trip Blank	5020566607	Water	09/14/18
Dup	5020566608	Water	09/14/18
MW-33MS	5020566603MS	Water	09/14/18
MW-33MSD	5020566603MSD	Water	09/14/18

**Indicates sample underwent Level IV validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Offsite Groundwater Monitoring Well Redevelopment & Sampling Work Plan, Franklin Power Products, Inc./Amphenol Corporation, Franklin, Indiana (September 2018) and a modified outline of the USEPA National Functional Guidelines (NFG) for Organic Superfund Methods Data Review (January 2017). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) SW 846 Method 8260C

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Level IV data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J (Estimated): The compound or analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation.

U (Non-detected): The compound or analyte was analyzed for and positively identified by the laboratory; however the compound or analyte should be considered non-detected at the reported concentration due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The compound or analyte was reported as not detected by the laboratory; however the reported quantitation/detection limit is estimated due to non-conformances discovered during data validation.

R (Rejected): The sample results were rejected due to gross non-conformances discovered during data validation. Data qualified as rejected is not usable.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected compound or analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For compounds where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the compounds, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all compounds were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 30.0% for all compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all compounds.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Sample Trip Blank was identified as a trip blank. No contaminants were found.

Sample Equipment Blank was identified as an equipment blank. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits with the following exceptions:

Sample	Surrogate	%R (Limits)	Affected Compound	Flag	A or P
Equipment Blank	Toluene-d8	111 (87-110)	All compounds	NA	-
Trip Blank	Toluene-d8	111 (87-110)	All compounds	NA	-

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

X. Field Duplicates

Samples MW-34** and Dup were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Compound	Concentration (ug/L)		RPD
	MW-34**	Dup	
Tetrachloroethene	44.8	43.9	2
1,1,1-Trichloroethane	2.9	2.8	4
Trichloroethene	16.1	16.1	0

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Compound Quantitation

All compound quantitations met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XIII. Target Compound Identifications

All target compound identifications met validation criteria for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XIV. System Performance

The system performance was acceptable for samples which underwent Level IV validation. Raw data were not reviewed for Level III validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected in this SDG.

The quality control criteria reviewed were met and are considered acceptable. Based upon the data validation all results are considered valid and usable for all purposes.

Former Amphenol Facility
Volatiles - Data Qualification Summary - SDG 50205666

No Sample Data Qualified in this SDG

Former Amphenol Facility
Volatiles - Laboratory Blank Data Qualification Summary - SDG 50205666

No Sample Data Qualified in this SDG

Former Amphenol Facility
Volatiles - Field Blank Data Qualification Summary - SDG 50205666

No Sample Data Qualified in this SDG

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: MW-31 **Lab ID: 50205666001** Collected: 09/14/18 13:46 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	ND	ug/L	5.0	0.47	1		09/18/18 06:44	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 06:44	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 06:44	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 06:44	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 06:44	75-09-2	
Tetrachloroethene	**53.7**	ug/L	5.0	0.61	1		09/18/18 06:44	127-18-4	
1,1,1-Trichloroethane	**8.9**	ug/L	5.0	0.89	1		09/18/18 06:44	71-55-6	
Trichloroethene	**52.4**	ug/L	5.0	0.80	1		09/18/18 06:44	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 06:44	75-01-4	
Surrogates									
Dibromofluoromethane (S)	91	%.	89-116		1		09/18/18 06:44	1868-53-7	
4-Bromofluorobenzene (S)	101	%.	85-111		1		09/18/18 06:44	460-00-4	
Toluene-d8 (S)	107	%.	87-110		1		09/18/18 06:44	2037-26-5	

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REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: MW-32 **Lab ID: 50205666002** Collected: 09/14/18 14:46 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	ND	ug/L	5.0	0.47	1		09/18/18 07:20	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 07:20	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 07:20	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 07:20	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 07:20	75-09-2	
Tetrachloroethene	ND	ug/L	5.0	0.61	1		09/18/18 07:20	127-18-4	
1,1,1-Trichloroethane	**0.96J**	ug/L	5.0	0.89	1		09/18/18 07:20	71-55-6	
Trichloroethene	**1.7J**	ug/L	5.0	0.80	1		09/18/18 07:20	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 07:20	75-01-4	
Surrogates									
Dibromofluoromethane (S)	91	%.	89-116		1		09/18/18 07:20	1868-53-7	
4-Bromofluorobenzene (S)	102	%.	85-111		1		09/18/18 07:20	460-00-4	
Toluene-d8 (S)	110	%.	87-110		1		09/18/18 07:20	2037-26-5	

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: MW-33 **Lab ID: 50205666003** Collected: 09/14/18 12:36 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	ND	ug/L	5.0	0.47	1		09/18/18 07:56	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 07:56	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 07:56	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 07:56	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 07:56	75-09-2	
Tetrachloroethene	ND	ug/L	5.0	0.61	1		09/18/18 07:56	127-18-4	
1,1,1-Trichloroethane	ND	ug/L	5.0	0.89	1		09/18/18 07:56	71-55-6	
Trichloroethene	ND	ug/L	5.0	0.80	1		09/18/18 07:56	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 07:56	75-01-4	
Surrogates									
Dibromofluoromethane (S)	92	%.	89-116		1		09/18/18 07:56	1868-53-7	
4-Bromofluorobenzene (S)	104	%.	85-111		1		09/18/18 07:56	460-00-4	
Toluene-d8 (S)	109	%.	87-110		1		09/18/18 07:56	2037-26-5	

9/18/18

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: MW-34 **Lab ID: 50205666004** Collected: 09/14/18 15:48 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	ND	ug/L	5.0	0.47	1		09/18/18 08:32	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 08:32	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 08:32	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 08:32	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 08:32	75-09-2	
Tetrachloroethene	**44.8**	ug/L	5.0	0.61	1		09/18/18 08:32	127-18-4	
1,1,1-Trichloroethane	**2.9J**	ug/L	5.0	0.89	1		09/18/18 08:32	71-55-6	
Trichloroethene	**16.1**	ug/L	5.0	0.80	1		09/18/18 08:32	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 08:32	75-01-4	
Surrogates									
Dibromofluoromethane (S)	91	%.	89-116		1		09/18/18 08:32	1868-53-7	
4-Bromofluorobenzene (S)	103	%.	85-111		1		09/18/18 08:32	460-00-4	
Toluene-d8 (S)	108	%.	87-110		1		09/18/18 08:32	2037-26-5	

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: MW-35 **Lab ID: 50205666005** Collected: 09/14/18 11:45 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	**1.2J**	ug/L	5.0	0.47	1		09/18/18 09:09	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 09:09	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 09:09	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 09:09	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 09:09	75-09-2	
Tetrachloroethene	ND	ug/L	5.0	0.61	1		09/18/18 09:09	127-18-4	
1,1,1-Trichloroethane	**18.7**	ug/L	5.0	0.89	1		09/18/18 09:09	71-55-6	
Trichloroethene	**84.2**	ug/L	5.0	0.80	1		09/18/18 09:09	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 09:09	75-01-4	
Surrogates									
Dibromofluoromethane (S)	91	%.	89-116		1		09/18/18 09:09	1868-53-7	
4-Bromofluorobenzene (S)	103	%.	85-111		1		09/18/18 09:09	460-00-4	
Toluene-d8 (S)	109	%.	87-110		1		09/18/18 09:09	2037-26-5	

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: Equipment Blank **Lab ID: 50205666006** Collected: 09/14/18 13:00 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	ND	ug/L	5.0	0.47	1		09/18/18 09:45	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 09:45	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 09:45	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 09:45	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 09:45	75-09-2	
Tetrachloroethene	ND	ug/L	5.0	0.61	1		09/18/18 09:45	127-18-4	
1,1,1-Trichloroethane	ND	ug/L	5.0	0.89	1		09/18/18 09:45	71-55-6	
Trichloroethene	ND	ug/L	5.0	0.80	1		09/18/18 09:45	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 09:45	75-01-4	
Surrogates									
Dibromofluoromethane (S)	92	%.	89-116		1		09/18/18 09:45	1868-53-7	
4-Bromofluorobenzene (S)	102	%.	85-111		1		09/18/18 09:45	460-00-4	
Toluene-d8 (S)	111	%.	87-110		1		09/18/18 09:45	2037-26-5	S3

9-09-18

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ANALYTICAL RESULTS

Project: Former Amphenol Facility
Pace Project No.: 50205666

Sample: Dup **Lab ID: 50205666008** Collected: 09/14/18 08:00 Received: 09/14/18 17:53 Matrix: Water

Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
8260/5030 MSV	Analytical Method: EPA 8260								
1,1-Dichloroethane	ND	ug/L	5.0	0.47	1		09/18/18 10:58	75-34-3	
1,2-Dichloroethane	ND	ug/L	5.0	0.32	1		09/18/18 10:58	107-06-2	
cis-1,2-Dichloroethene	ND	ug/L	5.0	0.37	1		09/18/18 10:58	156-59-2	
trans-1,2-Dichloroethene	ND	ug/L	5.0	0.86	1		09/18/18 10:58	156-60-5	
Methylene Chloride	ND	ug/L	5.0	5.0	1		09/18/18 10:58	75-09-2	
Tetrachloroethene	**43.9**	ug/L	5.0	0.61	1		09/18/18 10:58	127-18-4	
1,1,1-Trichloroethane	**2.8J**	ug/L	5.0	0.89	1		09/18/18 10:58	71-55-6	
Trichloroethene	**16.1**	ug/L	5.0	0.80	1		09/18/18 10:58	79-01-6	
Vinyl chloride	ND	ug/L	2.0	0.27	1		09/18/18 10:58	75-01-4	
Surrogates									
Dibromofluoromethane (S)	92	%.	89-116		1		09/18/18 10:58	1868-53-7	
4-Bromofluorobenzene (S)	103	%.	85-111		1		09/18/18 10:58	460-00-4	
Toluene-d8 (S)	108	%.	87-110		1		09/18/18 10:58	2037-26-5	

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REPORT OF LABORATORY ANALYSIS

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LDC #: 43160C1 **VALIDATION COMPLETENESS WORKSHEET** Date: 9/24/18
SDG #: 50205666 Level III/IV Page: 1 of 1
Laboratory: Pace Analytical Energy Services, LLC Reviewer: 5
2nd Reviewer: 5

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B C

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/Δ	
II.	GC/MS Instrument performance check	Δ	20
III.	Initial calibration/ICV	A/Δ	%D ≤ 15/30, r² ICV ≤ 30 CCV ≤ 20
IV.	Continuing calibration	Δ	
V.	Laboratory Blanks	Δ	
VI.	Field blanks	ND	EB=6 TB=7
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	Δ	
IX.	Laboratory control samples	A	LCS
X.	Field duplicates	SW	D = 4,8
XI.	Internal standards	Δ	
XII.	Compound quantitation RL/LOQ/LODs	Δ	Not reviewed for Level III validation.
XIII.	Target compound identification	Δ	Not reviewed for Level III validation.
XIV.	System performance	A	Not reviewed for Level III validation.
XV.	Overall assessment of data	Δ	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Level IV validation

	Client ID	Lab ID	Matrix	Date
1	MW-31	5020566601	Water	09/14/18
2	MW-32	5020566602	Water	09/14/18
3	MW-33	5020566603	Water	09/14/18
4	MW-34**	5020566604**	Water	09/14/18
5	MW-35	5020566605	Water	09/14/18
6	Equipment Blank	5020566606	Water	09/14/18
7	Trip Blank	5020566607	Water	09/14/18
8	Dup	5020566608	Water	09/14/18
9	MW-33MS	5020566603MS	Water	09/14/18
10	MW-33MSD	5020566603MSD	Water	09/14/18
11				
12				
13	2132419			

LDC #: 43160C1

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: FT
2nd Reviewer: M

Method: Volatiles (EPA SW 846 Method 8260B) C

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
Were all percent relative standard deviations (%RSD) ≤ ~~30%/15%~~ 20% and relative response factors (RRF) ≥ 0.05?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) < ~~20~~ 30%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) and relative response factors (RRF) within method criteria for all CCCs and SPCCs?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) ≥ 0.05?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation completeness worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target compounds detected in the field blanks?		✓		
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?		✓		
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?		✓		

LDC #: 43160C1

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: PT
2nd Reviewer: T

Validation Area	Yes	No	NA	Findings/Comments
VIII. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.	✓			
Was a MS/MSD analyzed every 20 samples of each matrix?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target compounds detected in the field duplicates?	✓			
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within + 30 seconds of the associated calibration standard?	✓			
XII. Compound quantitation				
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target compound identification				
Were relative retention times (RRT's) within + 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1.
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Surrogate Spikes

Page: 1 of 1
Reviewer: FT
2nd Reviewer: A

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were all surrogate %R within QC limits?

Y (N) N/A If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R out of outside of criteria?

#	Sample ID	Surrogate	%Recovery (Limits)	Qualifications
	6	Tol	111 (87-110)	Jdu /P ND
			( )	
	7	↓	111 (↓)	Jdu /P ND
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	
			( )	

SMC1 (TOL) = Toluene-d8
SMC2 (BFB) = Bromofluorobenzene
SMC3 (DCE) = 1,2-Dichloroethane-d4
SMC4 (DFM) = Dibromofluoromethane

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page: 1 of 1
Reviewer: FT
2nd reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were field duplicate pairs identified in this SDG?
Y N N/A Were target compounds detected in the field duplicate pairs?

Compound	Concentration (ug/L)		RPD (≤ %)	QUAL
	4	8		
AA	44.8	43.9	2	
N	2.9	2.8	4	
S	16.1	16.1	0	

Compound	Concentration ( )		RPD (≤ %)	QUAL

Compound	Concentration ( )		RPD (≤ %)	QUAL

Compound	Concentration ( )		RPD (≤ %)	QUAL

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: AQ

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs
X = Mean of the RRFs

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported RRF (10 std)	Recalc RRF (10 std)	Reported Average RRF (initial)	Recalc Average RRF (initial)	Reported %RSD	Recalc %RSD
1	ICAL	9/7/18	BQQ (1st internal standard)	0.27681	0.27681	0.28870	0.28870	5.89585	5.896
			AA (2nd internal standard)	0.40110	0.40110	0.41088	0.41088	7.62310	7.623
			(3rd internal standard)						
			(4th internal standard)						
2			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
3			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						
4			(1st internal standard)						
			(2nd internal standard)						
			(3rd internal standard)						
			(4th internal standard)						

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV 0420	9/18/18	QQQ (1st internal standard)	0.28870 ~~0.27896~~ FT	0.25642	0.25642	11.1818	11.1818
			AA (2nd internal standard)	0.4088	0.3542	0.3542	13.7408	13.7408
			(3rd internal standard)					
			(4th internal standard)					
2			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
3			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					
4			(1st internal standard)					
			(2nd internal standard)					
			(3rd internal standard)					
			(4th internal standard)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Page: 1 of 1
Reviewer: FT
2nd reviewer: A

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #4

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	50.0	45.5	91	91	0
1,2-Dichloroethane-d4					
Toluene-d8	50.0	53.9	108	108	0
Bromofluorobenzene	↓	51.4	103	103	0

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane					
1,2-Dichloroethane-d4					
Toluene-d8					
Bromofluorobenzene					

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer: [signature]

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC) MSC = Matrix spike concentration MSDC = Matrix spike duplicate concentration

MS/MSD sample: 9 + 10

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	-----	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
~~1,1-Dichloroethene~~	50	50	ND	45.4	43.3	91	91	87	87	5	5
Trichloroethene	↓	↓	↓	43.1	42.5	86	86	85	85	1	1
Benzene											
Toluene											
Chlorobenzene											

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC/MS VOA (EPA Method 8260B)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration; SA = Spike added

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC) LCSC = Laboraotry control sample concentration LCSDC = Laboratory control sample duplicate concentration

LCS ID: 2132420 LCS

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalculated
~~1,1-Dichloroethene~~	50	NA	46.5	NA	93	93				
Trichloroethene	50	NA	44.3	↓	89	89	NA			
Benzene										
Toluene										
Chlorobenzene										

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 43160C1

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT
2nd reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Y N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #4 , AA

Conc. = $\frac{(66424)(50.0)}{(180321)(0.41088)}$

= 44.826 ng/L

#	Sample ID	Compound	Reported Concentration (ng/L)	Calculated Concentration (ng/L)	Qualification
	#4	AA	44.8	44.826	